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CORPORATE
ENGINEERING
DEPARTMENT

Appropriation Project Definition Report, 2-25-76, WGK 4023896 - 927

APPROPRIATION PROJECT DEFINITION REPORT

CEA 3088

Krummrich Sewer I

Monsanto Industrial Chemicals Company

Process Chemicals Plant

W. G. Krummrich Plant

February 25, 1976 WGK 4023896

Revision 1

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CE-14 Rev. 2-72

APPROPRIATION PROJECT DEFINITION REPORT

CEA 3088

Krummrich Sewer I
Revision 1
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APPROPRIATION PROJECT DEFINITION REPORT

CEA 3088

Krummrich Sewer I
Revision 1

Table of Contents

WGK 4023898

I. PROJECT SYNOPSIS

This project will provide the replacement for an existing badly deteriorated trunk sewer which services a large central area of W. G. Krummrich Plant. Most of the existing sewer will be abandoned and new routes followed which do not run beneath manufacturing buildings. Flow measurement devices will be provided at selected locations for monitoring aqueous waste streams.

AR approval is targeted for April, 1976, with engineering design to start upon approval. Mechanical completion is expected in the third quarter of 1977.

An AR grade capital estimate for $1600M + 15% capital and $350M expense was approved in CED on February 13, 1976.

II. PROJECT COMMITMENTS

A. Project Purposes

This project will provide facilities to replace an existing sewer (Section 3 sewer) in WGK which has deteriorated beyond the point of economical repair. Flow measurement devices (flumes) will be installed at selected locations to permit monitoring of aqueous waste flows.

B. Tone

Replacement sewers will be routed to avoid locating them beneath buildings.

Interruptions to production facilities must be avoided wherever possible and minimized where unavoidable.

C. Capacity

New sewers will be designed to handle flows from:

1. Existing facilities with flows as defined in the current plantwide aqueous flow reduction program, which has defined maximum dry weather flows at 4370 gpm.
2. Planned expansions in the area serviced by the new sewers, as indicated in Appendix C.
3. Maximum run-off rates expected to occur from rainfall in a five-year period. Sewer sizing will be based on a fifteen minute concentration period and assuming a 47% run-off to the sewer.

II. PROJECT COMMITMENTS (Continued)

D. Location

The new sewers will be located in the central portion of W.G.Krummrich Plant, servicing the area bounded by Falling Springs Road, the north plant boundary, G Street, and Fifth Street.

E. Estimated Cost Range

An AR grade capital estimate for $1600M ± 15% capital and $250M expense was approved in CDD on February 13, 1976. The expense estimate includes $200K to provide temporary facilities required to maintain production operations while installing sewer facilities.

F. Expected Timing

AR approval is targeted for April, 1976 with design to start after project approval. Field work is expected to start in February 1977, with mechanical completion in the third quarter, 1977.

G. Products and By-Products

None

H. Process Technology

No new process technology will be employed in this project.

I. Raw Materials

None

J. Utilities and Energy Conservation

An additional 2HP will be required for lift pump facilities at Building BK.

No energy conservation savings are claimed for this project.

II. PROJECT COMMITMENTS (Continued)

K. Environmental

Intent

This project will correct existing problems caused by some of the deteriorated sewer facilities at W.G.K. Sewers will be abandoned as shown in the Category 90 schedule; minimum treatment will be the plugging of both ends of a run, maximum treatment will be complete removal and backfill of resultant excavations. Measuring flumes will be provided at nine locations to permit monitoring aqueous waste flows from selected source areas.

Description of Wastes

Aqueous wastes discharged to Sauget Village sewers will not be changed as a result of installing this project.

Provision has been made for handling waste flows from planned projects. See Appendix C.

Descriptions of wastes generated by the planned projects will be included in the respective Project Definition Reports.

A potential exists for flammable vapors to accumulate in the sewer box serving Dept. 218 (Muriatic Acid) and Dept. 233 (Monochlorobenzene). An appropriate venting system will be provided for this sewer box.

Noise

No noise problems will exist as a result of this project.

L. Employee Exposure

This project will not alter the quality of aqueous waste flows entering the WGK sewer systems or discharged to the Sauget Village sewers.

II. PROJECT COMMITMENTS (Continued)

M. Manning

No additional manpower will be required to operate these facilities.

N. Production Continuity

Much of the work will be performed in and around existing manufacturing facilities. Undefined underground obstacles can interfere with scheduled construction activities. Provisions to maintain operations during construction activities will be required. Where unavoidable, shutdowns must be minimized.

O. Other Commitments

Provision is incorporated in the layout and design to permit future extension of sewer facilities north of Second Street along E Street extension.

Process sewers will be of acid-proof construction with poured sulfur joints or equivalent.

The proposed sewer facilities are indicated in Fig. I, Appendix A. Preliminary estimates are based on vitrified clay pipe (VCP), acid brick lined sewer boxes, and combined process flow-runoff stream except for the sewer line between Box 3P1 and Box 3I41. This line will be a concrete box culvert. Alternates are being considered but will not be included in the project unless:

1. The project cost is reduced.
2. Project objectives are met with no increase in risk.
3. Major changes have been reviewed and concurred with by Manufacturing representatives.

III. PROJECT RISKS

A. Project Risks

This project requires extensive excavation work and construction activities below grade. Underground obstructions not shown on existing drawings may require design modifications or relocations. Dewatering of excavations may be required due to water table levels.

B. Likelihood of Changes in Definition

The proposed sewer routes and elevations have been reviewed with W.G.K. representatives. Major changes in definition are not expected. Unidentified underground obstructions may necessitate some minor alterations in routing or elevations.

IV. PROJECT SITE PREMISES

A. Site Location Premises

Sewers will be installed in and around existing operating departments at W.G.Krummrich Plant. Available drawings of existing underground facilities have been obtained from W.G.K. files and incorporated in sewer routing plans. Additional underground obstacles (sewers, pipes, electrical cable, and foundations) not indicated on existing drawings may be encountered during construction. The general north-south route of D Street is a filled-in dead creek; composition of soils are defined for several specific locations in the following documents.

1. Site Development Manual, issued August, 1975.
2. Dept. 218, CEA 2930 HCl Purification Plant. Two soil borings made in August, 1975. Soil report issued.
3. Dept. 221, CEA 2566 ONCB Expansion. Six test borings made in October, 1974. Soil report issued.

IV. PROJECT SITE PREMISES (Continued)

A. Site Location Premises (continued)

Water table level varies with rainfall history. Nominal level is 10 ft. below grade. Excavations of 11-12 foot depth will be required in the Third Street-Falling Springs Road and D Street-Fifth Street areas. Dewatering (portable pumps) and appropriate shoring in excavations will be required.

The box culvert running from Building BK to Third Street will be run between and/or under existing railroad tracks and paved roads for most of its length. Interuptions to rail switching activities must be minimized.

B. Utility Premises

Existing electrical feeder facilities are adequate to handle the increase of 2HP.

C. Ex-Project Waste Treatment

No waste streams will be generated by this project. Treatment of existing sewer flows will continue in Sauget Village facilities.

D. Service Facilities

No changes in service facilities will be required.

E. Related Projects

Planned and approved projects for W.G.K. have been considered in laying out new sewers and boxes. No significant change in project complexity or scheduling will result from these projects.

F. Other Premises WGK 4023904

Repairs will be limited to existing sewers only where tie-ins or modifications are necessary to meet project objectives. No general W.G.K. sewer repairs are included in this project.

Project scheduling will be coordinated with scheduled departmental shutdowns to minimize production outages whenever possible.

Illinois EPA construction and operating permits are not required per Illinois Pollution Control Board rules and regulations.

V. PROJECT DESCRIPTION AND STRATEGY

A. Process and Facilities Description

The sewers provided by this project will rely on gravity flow except for the lift station servicing Building BK. The sewers will drain in a north to south direction and tie in to existing Sauget Village sewers running west along the southern portion of W.G.K. Plant.

B. Diagrams and Plant Layouts

Figure I, Appendix A, shows the preliminary plot plan covering the new sewer lines, active sewer lines being retained in the area involved, and lines to be abandoned.

C. Control of Hazards

Excavations up to twelve feet in depth will be required to install new sewer lines. All unidentified underground obstructions should be treated with caution until they have been identified with the assistance of appropriate plant personnal. The obstructions can include such items as city and well water lines, power and telephone lines, sewers, and foundations. Appropriate shoring will be required to prevent cave-ins of excavations.

The excavations will run through a filled-in dead creek bed and will contain wastes and residues from old operating departments. Caution should be exercised in handling excavated material so as to minimize contact with it.

Active sewers will contain normal plant effluents. Most flows are acidic and also contain various organic compounds. Care should be taken to avoid contact with these streams and to minimize spills and leaks during construction activities and tie-ins. Sump pumps will be required for dewatering some sites due to water table levels and/or sewer line leaks.

Roadways and railways will normally remain in operation during construction activity. Plant safety, plant fire department, plus plant distribution and maintenance personnal must be notified in advance of temporary closing of roads and tracks. Status reports on construction progress will be made to these personnal on an agreed-to frequency.

V. PROJECT DESCRIPTION AND STRATEGY (continued)

D. Project Strategy

1. Design will be done by an engineering contractor.

2. Significant data exist on underground obstructions and their location. This data will be available for detailed design activities.

3. A majority of the construction will be done on a lump sum basis. Arrangements for cost-plus clauses will be required for extras such as dewatering and handling unidentified underground obstacles.

4. Construction activity is expected to commence about January 1, 1977 and be completed during May 1977.

5. All construction work will be by contract personnel. Plant maintenance personnel will not be involved in actual construction activities.

6. Contracts for most building trade unions will terminate in mid-1977. The pipefitters' contract ends in January, 1977, and the insulators' contract ends in October, 1977. Electricians have been signing one-year contracts; the present one ends in September, 1976. A major coal gasification plant scheduled for installation near New Athens, Illinois, is not expected to conflict with manpower needs for CEA 3088.

7. Production outages associated with sewer construction activities should be avoided where possible and minimized where necessary. Construction schedules will be coordinated with the W.G.K. maintenance shutdown schedules wherever feasible.

8. Overtime use will be restricted to activities necessary to complete critical tie-ins, to minimize shutdown times for operating departments, or to reduce overall project costs.

9. Arrangements will be made for plant liaison personnel to assist in evaluating unidentified obstacles which are encountered during excavation.

10. Construction schedules will include use of alternate activities for personnel in cases where obstacles necessitate cessation of activities at the primary site.

V. PROJECT DESCRIPTION AND STRATEGY (continued)

E. Facilities Description by Code of Accounts

Much of the detailed information required for the appropriation cost estimate is based on existing drawings and data obtained from W.G.K. files. The primary costs relating to this project are in Categories 06 and 15, Excavations and Sewers. Assumptions made for estimating must be consistent with the Definition Report. Such assumptions are to be recorded on the cost estimate worksheets for reference.

Direct capital cost categories not specifically listed are not applicable to this project.

01 - Equipment

101,000. Two centrifugal sewage pumps (non-clog),
102.000 70 gpm, 10 TDH, with 9 foot long extensions, ductile iron.
101.001 Two motors for sewage pumps.
102.001 1 HP, 1760 RPM, 3 phase, 60 cycle, 440 volt.

02 - Instrumentations

1 - On-Off float switch for centrifugal sewage pumps.

1 - Sonic level indicator, portable for use with sewer flumes.

9 - Leopold - Lagco flumes for installation in selected sewer boxes. Flumes are required for the following sized sewers:

1 - 36 inch
1 - 24 inch
1 - 15 inch
4 - 12 inch
2 - 8 inch
9 - Total

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03 - Setting and Testing Equipment, and

04 - Setting and Testing Instruments

An appropriate cost allowance based on experience should be provided for this category.

V. PROJECT DESCRIPTION AND STRATEGY (Continued)

E. Facilities Description by Code of Accounts

06 - Excavation

Excavation requirements are tabulated in Appendix B, Table I for new sewers and abandoned sewer work. Water table elevation is a nominal ten feet below grade, subject to variations based on precipitation history. Dewatering equipment will be required. Some unidentified underground obstructions may be encountered. Sewer lines will run through areas of land fill and/or a dead creek bed.

11 - Piping

Vent system for Sewer Box 3F' to consist of a 3 inch Kynar lined vertical pipe 30 feet high plus 100 feet of 3/4 inch steam line.

13 - Electrical

Starters and wiring for two sewer sump pumps for the Building BK sewage lift station.

Electrical classification will be general purpose.

15 - Sewers, Drains, and Plumbing

This project replaces the existing trunk sewer for W.G.K. Section 3 by extending two existing sewers northward along G and E Streets plus the installation of a new sewer along D Street. See Figure I, Appendix A. Layout and elevations include provision for a future extension along E Street north of Second Street and for compatibility with a long range plan for draining Monsanto land north of Monsanto Avenue.

New sewer line descriptions are defined in Appendix B, Table I. Three types of sewer piping are to be used.

a. Ductile iron soil pipe - schedule 40
b. Reinforced concrete culvert.
c. Vitrified clay pipe (VCP) with a reinforced concrete encasement. High early strength concrete will be used to minimize downtime.

V. PROJECT DESCRIPTION AND STRATEGY (Continued)

E. Facilities Description by Code of Accounts (continued)

15 - Sewers, Drains, and Plumbing (continued)

Comments relating to sewer construction and design.

a. All VCP joints will be sealed with poured sulfur (Spec A8.2, Std 8, Fig.3) or equivalent.

b. Manholes.

New manholes will be built according to WGK standard for brick-lined concrete boxes or approved equivalent. Average box depth will be about 11 feet below grade. Required quantities are

15 manholes of 4'0" I.D.
4 manholes of 5'0" I.D.

Improvements will be made to the following boxes:

1. Box 3L'. Rebuilt to receive surface flows plus sanitary line from Building 3D, Box 3L. Membrane and acid brick lining will be installed.
2. Alter sump 3L-X in Dept 209 by raising the bottom, plugging a sewer, and installing a membrane and acid brick lining. Provide 15 ft. of acid brick lined trench sewer to Box 3L.
3. Box 3F (Department 233) to be abandoned in place. The existing sewer will be extended to Box 3F.
4. Box 3P1 will be modified to change direction of flow and to accomodate two new sewer sump pumps, Items 101 and 102.Top of box must be raised approximately two feet.
5. Box 3R2 will be modified to change direction of flow.

Tie-ins will be required at the nineteen (19) manholes listed below:

3F, 3F' with Dept 218, 4F, 3G, 3I-4, 3I-9A, 3I-12, 3I-21', 2K, 3R', 3R-1, 3R-2, 3S', 3T-1, 3T-4, 3U, 3U-3 (two tie-ins), and 2U.

c. Provide full sheeting and bracing for all excavated trenches for VCP sewers.

V. PROJECT DESCRIPTION AND STRATEGY (Continued)

E. Facilities Description by Code of Accounts (continued)

15 - Sewers, Drains, and Plumbing (continued)

d. Box culvert (from Box 3P-2 to 3I-41, see Table I, Appendix B) will be of reinforced concrete construction, suitable for supporting maintenance vehicles required for adjacent departments. The culvert will run between tracks and under portions of curved tracks. Removable cover plates or grating are required for 25% of length of culvert. Top of culvert will be at or near grade. Exterior subsoil surfaces will be coated with asphalt. Surface edges will be protected with 3 inch angle iron shapes.

e. Provide three acid-proof containment pads approximately 10 ft by 30 ft over box culvert. Pads will drain into existing VCP sewers.

f. Provide 90 ft. of ductile iron drain (8") from Second and D Streets to Box 3Q.

19 - Insulation

For 100 ft of 3/4 inch steam line at Box 3F'.

90 - Dismantling

Abandoned portions of existing sewers will require the following description of work:

a. Collapse and remove (excavation included in Category 06.)

Location, Boxes	Size, Inches	Length, Ft.
3S' to 3Q'	18	200
3G to 4F	15	120
3I4 to 3I	15	20
3? to 3U-3	12	50

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V. PROJECT DESCRIPTION AND STRATEGY (Continued)

E. Facilities Description by Code of Accounts (continued)

90 - Dismantling (continued)

b. Excavate, collapse, remove, and backfill (additional backfilling material will be required).

Location, Boxes	Size, Inches	Length, Ft.	Depth, Ft.
3I-4 to 3I-1	15	50	8
3I-3 to 3I-1	12	50	8
3rd St. to 3I-3	12	60	4
3E-1 to 3E-2	12	50	10
Dept 218 to 3F	12	50	6
3S' Northside	10	15	7
3I-2 to 3I-1	8	90	7
3L' near RR	8	40	8
3R-3 to 3R	8	30	5

c. Plug and Fill with 6:1 mix of sand and concrete

Location, Boxes	Size, Inches	Length, Ft.	Fill (Cu.Ft/ ft.)
3G to 3 C	24	550 LF	
3M to BK bldg.	24	100	
Total		650	3.14
3I to 3-0	18	300 LF	
3O to 3Q	18	230	
3U to 3S'	18	200	
Total		730	1.76
3T to 3T-1	15	50 LF	
3F to 4E	15	125	
Total		175	1.23
3Q (southside)	12	15 LF	
3P-1 to 3P	12	115	
3E to 3E-1	12	50	
2nd st. to 3-0	12	30	
" 3-P	12	30	
" 3Q	12	50	
Total		290	0.79
3R-2 to 3R-1	10	50 LF	
3R-1 to 3R	10	125	
Total		175	0.55

V. PROJECT DESCRIPTION AND STRATEGY (Continued)

E. Facilities Description by Code of Accounts (continued)

90 - Dismantling (continued)

c. Plug and Fill with 6:1 mix of sand and concrete (continued)

Location, Boxes	Sizes, Inches	Length, Ft.
3N to street (grade	6	50 LF
3H to 3H-X (grade)	6	50 LF
3R-1 (southside)	6	20 LF
Total		120

d. Four foot diameter manholes.

1. Seven (7) to be broken out and removed:

Boxes 3U, 3U3, 3S, 3R, 3I-3, 2B-13N, 3I-19E.

2. Ten (10) to be filled with gravel or crushed rock:

Boxes 3E, 3F, 3I-2, 3M, 3N, 3O, 3P, 3Q, 3R-1, 3R-2.
Approximately 80 cubic yards of rock required.

e. Install acid proof plugs in old sewer ends.

Number	Size, Inches
2	24
2	18
1	15
6	12
2	8
1	6

f. Excavate and remove the following underground conduit and cables. Plug all exposed ends of conduit left in ground. Reference Drawing TS-E-8376.

1. Two six (6) ft. section of abandoned cable north of substation 7. (X-86 or 87, X-79)

V. PROJECT DESCRIPTION AND STRATEGY (Continued)

E. Facilities Description by Code of Accounts (continued)

90 - Dismantling (continued)

f. (continued)

2. One six (6) ft. section of abandoned conduit crossing sewer route at Third and D Streets (X-section 128, 109, 110, 127 at BX41).

3. One two hundred eighty (280) ft section of abandoned conduit paralleling new D Street sewer (X-section 110); and Boxes 41 and 42.

4. One six (6) ft. section of conduit located at Second and D Street. This section is scheduled to be abandoned by the time sewer installation commences. (X-36)

g. Remove six foot section of abandoned 8 inch line crossing the 36 inch sewer at Fourth and D Streets.

91 - Sales and Use Tax

A normal allowance should be provided for taxes.

92 - Repair Expense

Fill in slumped surfaces near Boxes 3E, 3F, and 3L with crushed limestone. Approximately 10 cubic yards required, total.

Inspect and repair (if necessary) existing 24 inch sewer between boxes 3I and 3G (125 ft.).

93 - Relocation and Modification Expense

a. Move or replace five (5) supports for 3 tank car unloading facilities.

b. Move two lighting standards back several feet.

c. Remove temporarily two RR switch-backs along "D" St. near 2nd and 3rd Streets.

d. Remove temporarily three sections of RR tracks, or plan on tunneling beneath same for installation of 3 VCP sewers of 15 to 24" diameter.

V. PROJECT DESCRIPTION AND STRATEGY (Continued)

E. Facilities Description by Code of Accounts (continued)

93 - Relocation and Modification Expense (continued)

e. Remove temporarily four segments of two box-flumes (12" x 12" cross-sect) used for spill containment at two tank-car stations.

f. Interfering underground telephone cables which may require relocation (funds included in estimate).

1. Two crossings in electrical conduit at corner of D and Second Street (possibly 200 pairs each).

2. One crossing beneath E St of 50 pairs (emerges at pole)

3. 150 ft of cable parallels sewer along "G" St. (200 pairs).

g. Relocate two - 6 inch stainless steel lines (jet exhausts) in Department 209. Approximately 200 ft. of additional 6 inch stainless steel pipe will be required, located between 15 ft. level and ground level.

h. City water lines which may require relocation (included in estimate):

1. One - 4 inch C.I. line paralleling sewer along D Street between Second and Third Streets - 100 ft. long.

2. Three - 3 inch C.I. lines crossing this sewer along D Street between Third and Fourth Streets.

3. One - 3 inch C.I. line crossing the sewer between Boxes 3E6 and 3F.

4. Two - 10 inch C.I. lines crossing the sewer along Fourth Street between 3E-5 and 3E-6.

5. One - 4 inch C.I. line paralleling east side of Building BW - 100 ft. long.

6. One - 6 inch C.I. line paralleling sewer between Boxes 3E-5 and 3H-1 - 250 ft. long.

V. PROJECT DESCRIPTION AND STRATEGY (Continued)

E. Facilities Description by Code of Accounts (continued)

93 - Relocation and Modification Expense (continued)

h. (continued)

7. One - 6 inch C.I. line crossing sewer at Third and D Streets.

8. One - 4 inch C.I. line crossing sewer at Second and D Streets.

9. One - 1 inch steel pipe paralleling sewer near Dept 221 - 50 ft. long.

10. One - 4 inch C.I. line crossing sewer at E and Second Streets.

11. One - 4 inch C.I. line crossing sewer at G and Second Streets.

12. One - 10 inch C.I. line crossing sewer at G and Second Streets.

13. One - 6 inch C.I. line paralleling E Street sewer - 100 ft. long.

14. One - 6 inch C.I. line crossing sewer at E and Third Streets.

i. Well water lines which may require relocation (included in estimate):

1. One - 10 inch line crossing sewer between Bldg BW and Dept 221.

2. One - 10 inch and two - 6 inch lines crossing sewer route near Dept 209.

3. One - 6 inch line paralleling sewer between Dept 209 and Bldg BD - 100 ft. long.

4. Two - 8 inch lines crossing sewer at D and Second Streets.

5. Three - 16 inch lines crossing sewer at D and Fourth Streets.

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V. PROJECT DESCRIPTION AND STRATEGY (Continued)

E. Facilities Description by Code of Accounts (continued)

93 - Relocation and Modification Expense (continued)

i. (continued)

6. One - 8 inch line crossing sewer at Third and E Streets.

7. One - 6 inch valve at Third and E Streets.

8. One - 8 inch and one - 6 inch lines crossing sewer near Second and E Streets.

j. Fire Water Lines which may require relocation (included in estimate).

1. One - 10 inch line crossing sewer at Third and D Streets.

2. One - 10 inch line paralleling sewer near Third and D Streets - 50 ft. long.

3. One - 10 inch line crossing sewer on Fourth Street between 3E-6 and 3F-1.

4. One - 10 inch line crossing sewer at E and Second Streets.

5. One - 10 inch line crossing sewer at E and Third Streets.

6. One - 6 inch line and hydrant at E and Third Streets.

7. One - 10 inch line crossing sewer at G and Second Streets.

k. Electrical lines which may require relocation (included in estimate).

1. One crossing of an active conduit at E and Second Streets (x section 82); Drawing TS-E-8376.

2. One crossing of an active conduit at G and Second Streets (x section 83).

V. PROJECT DESCRIPTION AND STRATEGY (Continued)

E. Facilities Description by Code of Accounts (continued)

93 - Relocation and Modification Expense (continued)

1. Relocation and Alterations of piping in Building BK:

One - 4 inch sewer line suspended from basement ceiling - 100 ft. long.

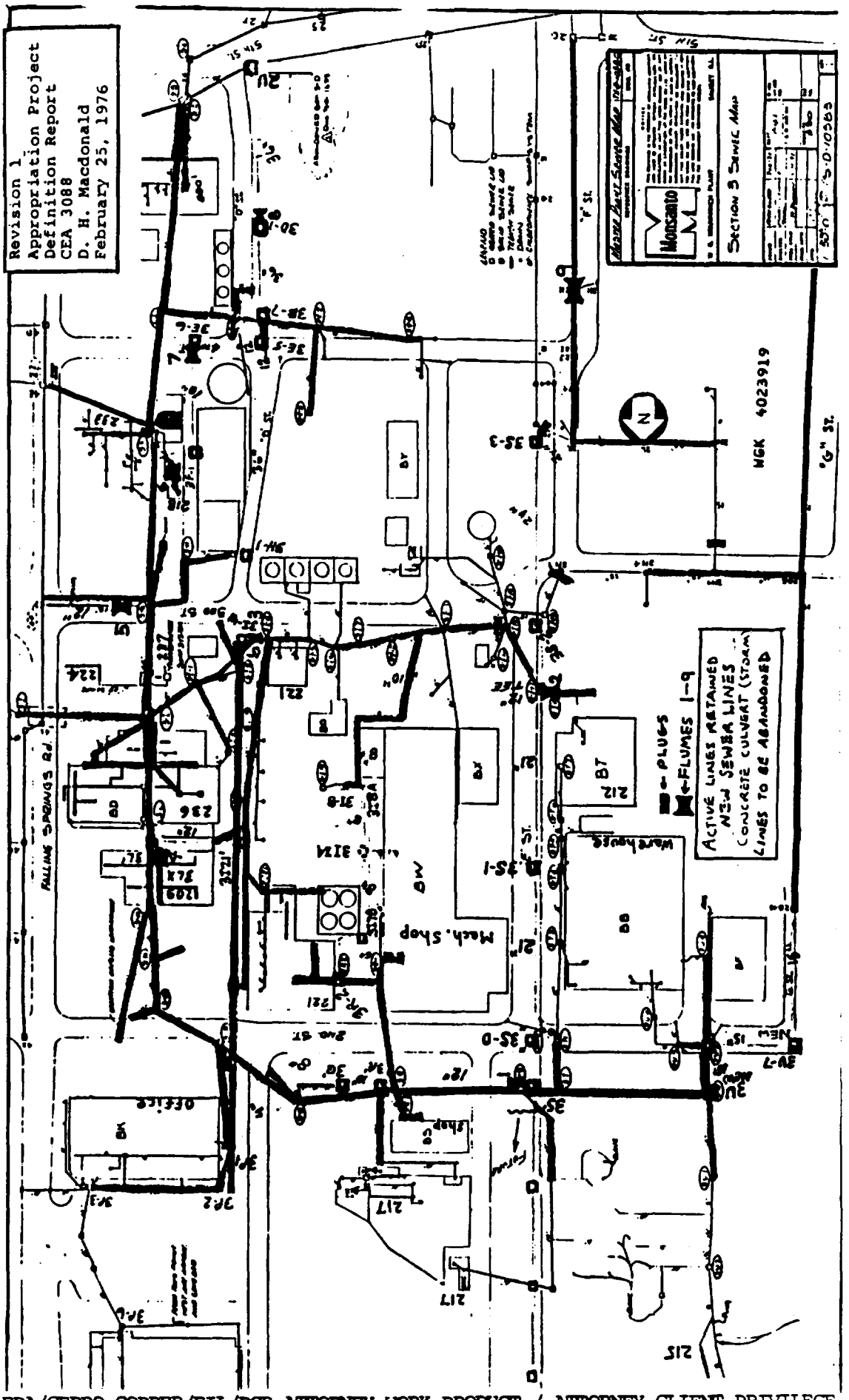
m. Removal of existing pavement and replacement after sewer is installed.

1. Concrete pavement - 1400 square yards.
2. Asphalt pavement - 100 square yards.

n. Relocation of dike wall for Dept 221 tank farm.

One section 8" thick x 3 ft. high x 20 ft. long required. Break out existing 10 ft. long wall and approximately 8 square yards of concrete floor.

APPENDIX A



APPENDIX B

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APPENDIX B

DESCRIPTION OF NEW SEWER LINE SEGMENTS

A. VITRIFIED CLAY PIPE

Sewer Segment	Length Ft.	Diameter In.	Concrete Rq'd (Bed+Enc) CF/LF	Reinforcing Bar #4	#6	Excavation Width Ft.	Dept Ft.	Required Volume Cu.Ft.
2B13 to 3U-7	150	15	4.29	14	5	3.5	7	
3U-7 to 3U-3'	100	15	4.29	14	5	3.5	7	
3U-3' to 3U	50	15	4.29	14	5	3.5	7	
3I-7B to 3R-1	30	6	2.61	8	3	3.0	6	
3I-8A to 3I-7A	80	8	2.61	8	3	3.0	8	
3I-7A to 3I-7B	80	8	2.61	8	3	3.0	8	
3I-7B to 3R-2	70	8	2.61	8	3	3.0	4	
2U to 3I-41	615	36	12.46	29	9	7.5	8 to 11 (avg.of 9.5)	
3I-41 to 3I-4	30	15	4.29	14	5	4.0	8	
3L' to 3I-21'	100	12	3.68	12	4	3.5	6	
3E5 to 3E-6	85	12	3.68	12	4	3.5	7	
3E6 to 3F-1	125	10	2.96	10	4	3.0	6	
3F-1 to Dept 218	30	8	2.61	8	3	3.0	5	
3F-1 to 3F	50	8	2.61	8	3	3.0	4	
3G to 4F	125	12	3.68	12	4	3.5	12	

APPENDIX B

DESCRIPTION OF NEW SEWER LINE SEGMENTS

A. VITRIFIED CLAY PIPE

Sewer Segment	Length Ft.	Diameter In.	Concrete Rq'd (Bed+Enc) CF/LF	Reinforcing Bar #4	#6	Excavation Width Ft.	Dept. Ft.	Required Volume Cu.Ft.
2K to 3S-2	240	24	7.53	21	7	6.0	11	
3S-2 to 3S'	500	21	6.27	18	7	5.5	9	
3S' to 3R'	165	12	3.68	12	4	3.5	8	
3R' to 3Q'	50	10	2.96	10	4	3.0	7	
3S-2 to 3I-12	30	12	3.68	12	4	3.5	10	
3S-1 to 3T-4	30	12	3.68	12	4	3.5	9	
3S-0 to 3T-1	30	12	3.68	12	4	3.5	8	
3S-0 to 3T-2	10	15	4.29	14	5	4.0	7	

APPENDIX B

DESCRIPTION OF NEW SEWER LINE SEGMENTS

B. DUCTILE IRON PIPE, NOT ENCASED

Sewer Segment	Length Ft.	Diameter In.	Concrete Rq'd (Bed+Enc) CF/LF	Reinforcing Bar #4	Reinforcing Bar #3	Excavation Req'd Width Ft.	Excavation Req'd Dept Ft.	Excavation Req'd Volume Cu.Ft.
Street to 3S-0	30	12	*			≤ 2	7	
3R3 to 3R'	50	6	*			≤ 2	7	
3Q' to 3P-1	150	4	*			≤ 2	5	

C. REINFORCED CONCRETE CULVERT

3" Angle Per Segment	Sewer Segment	Length Ft.	Diameter In.	Concrete Rq'd (Bed+Enc) CF/LF	Reinforcing Bar #4	Reinforcing Bar #3	Excavation Req'd Width Ft.	Excavation Req'd Dept Ft.	Excavation Req'd Volume Cu.Ft.
2	3P-2 to 3P	150	2'0"H x 2'0"W	5.00	26	30	4.0	3.5	
2	3P to 3I-41	450	2'6"H x 2'0"W	5.50	24	30	4.0	4.0	

Total 3 Inch Angle Required - 1200 Ft. - For Edges of Cover.

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APPENDIX C

APPENDIX C

PLANNED PROJECTS FOR SEWER 3 AREA

Reference Drawing TS-D-12206, as marked for Project Files.
Flow rates as defined in August, 1975.

Location	Project Identification	Project Description	Estimated Flow, GPM
Site 9	---	---	200
Site 10	CEA 2950	4-NDPA	108
Site 11	F 324	Phosphate Esters	157
Site 11	F 377	Multi-Phos Gard	56
Site 12	---	---	150
Site 13	---	Liquid Hydrocarbons	50
Site 14	---	---	150
Site 15	---	---	100
5th & F St.	---	Open Area	100
---	F 276	Santoflex	7
---	F 340	Penta Purification	1
---	CEA 2566	DNCB Consolidation	66
---	CEA 2852	Nitration Isomer Control	45
---	CEA 2884	Expansion 4-NDPA	20
---	CEA 2894	MCB Expansion	12
---	CEA 2930	HCl Recovery	6
		Combined Total Flow	1228

APPENDIX D

APPENDIX D

ENERGY STATEMENT

Total energy requirements for this project consist of 2 horsepower, connected. No energy savings are claimed.